EXERCISES

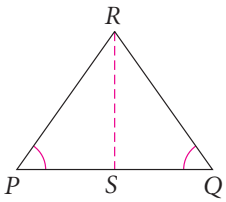
For more practice, see *Extra Practice.*

Practice and Problem Solving

A Practice by Example

Example 1 (page 211)

1. Developing Proof Supply the missing parts in this proof of the Converse of the Isosceles Triangle Theorem.

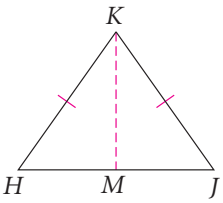


Begin with $\triangle PRQ$ with $\angle P \cong \angle Q$.
Draw **a.** ? , the bisector of $\angle PRQ$.

Given: $\angle P \cong \angle Q$, **b.** ? bisects $\angle PRQ$.
Prove: $\overline{PR} \cong \overline{QR}$

Statements	Reasons
1. $\overline{RS}$ bisects $\angle PRQ$.	**c.** ?
2. $\angle PRS \cong \angle QRS$	**d.** ?
3. $\angle P \cong \angle Q$	3. Given
4. $\overline{RS} \cong \overline{RS}$	**e.** ?
5. $\triangle PRS \cong \triangle QRS$	**f.** ?
6. $\overline{PR} \cong \overline{QR}$	6. CPCTC

2. Developing Proof Here is another way to prove the Isosceles Triangle Theorem. Supply the missing parts.



Begin with isosceles $\triangle HKJ$ with $\overline{KH} \cong \overline{KJ}$.
Draw **a.** ? , a bisector of the base $\overline{HJ}$.

Given: $\overline{KH} \cong \overline{KJ}$, **b.** ? bisects $\overline{HJ}$.
Prove: $\angle H \cong \angle J$

Statements	Reasons
1. $\overline{KM}$ bisects $\overline{HJ}$.	**c.** ?
2. $\overline{HM} \cong \overline{JM}$	**d.** ?
3. $\overline{KH} \cong \overline{KJ}$	3. Given
4. $\overline{KM} \cong \overline{KM}$	**e.** ?
5. $\triangle KHM \cong \triangle KJM$	**f.** ?
6. $\angle H \cong \angle J$	**g.** ?

Example 2 (page 212)

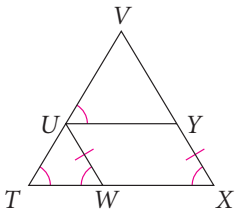
Developing Proof **Complete each statement. Explain why it is true.**

3. $\overline{VT} \cong$?

4. $\overline{UT} \cong$? $\cong \overline{YX}$

5. $\overline{VU} \cong$?

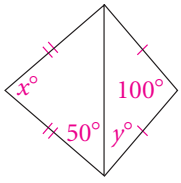
6. $\angle VYU \cong$?



Example 3 (page 212)

Algebra **Find the values of x and y.**

7.



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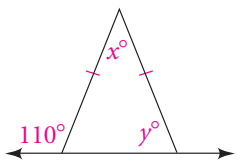

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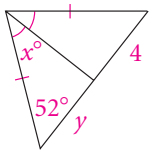
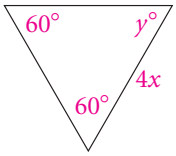


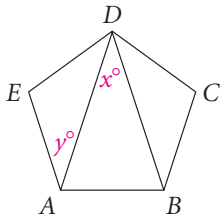
Algebra **Find the values of x and y.**

10.



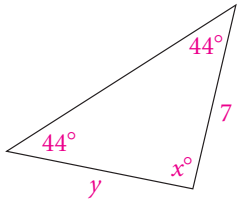
Perimeter is 54.

11.



ABCDE is a regular pentagon.

12.



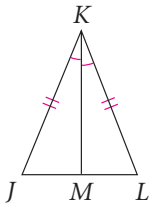
Find each value.

13. If $m\angle L = 58$, then $m\angle LKJ =$ ■.

14. If $JL = 5$, then $ML =$ ■.

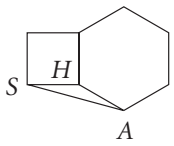
15. If $m\angle JKM = 48$, then $m\angle J =$ ■.

16. If $m\angle J = 55$, then $m\angle JKM =$ ■.



Example 4 (page 212)

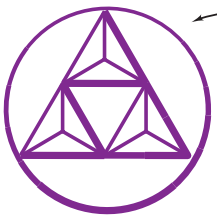
17. A square and a regular hexagon are placed so that they have a common side. Find $m\angle SHA$ and $m\angle HAS$.

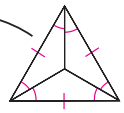


18. Five fences meet at a point to form angles with measures x, $2x$, $3x$, $4x$, and $5x$ around the point. Find the measure of each angle.

B Apply Your Skills

19. **Graphic Arts** The former logo for the National Council of Teachers of Mathematics is shown at the right. Trace the logo onto paper.



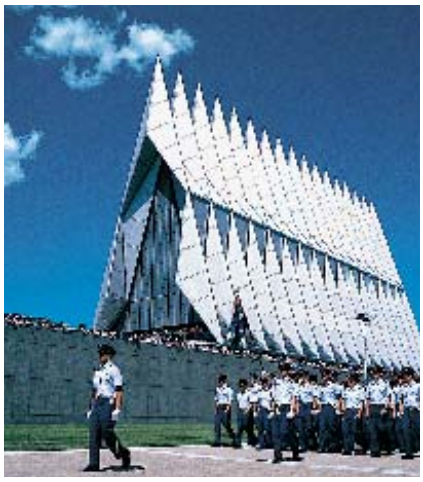


The triangles in the logo have these congruent sides and angles.

a. Highlight an obtuse isosceles triangle in the design. Then find its angle measures.

b. How many different sizes of angles can you find in the logo? What are their measures?

c. **Open-Ended** Design a logo using isosceles triangles. Give the measures of the angles in your logo.

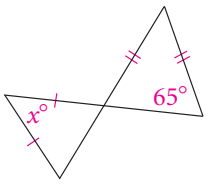


Exercise 20

20. **Architecture** Seventeen spires, pictured at the left, grace the majestic Cadet Chapel at the Air Force Academy in Colorado Springs, Colorado. Each spire is an isosceles triangle with a 40° vertex angle. Find the measure of each base angle.

Mental Math **Find the value of x.**

21.



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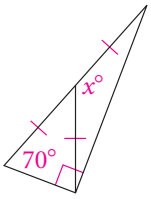

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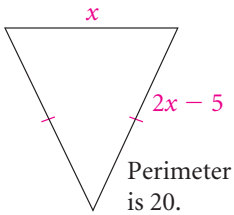
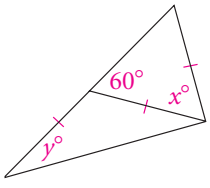


Perimeter is 20.

Algebra **Find the values of x and y.**

24.



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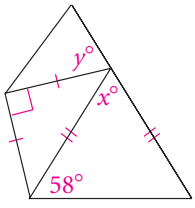

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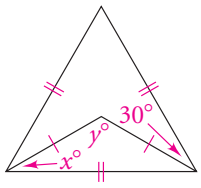


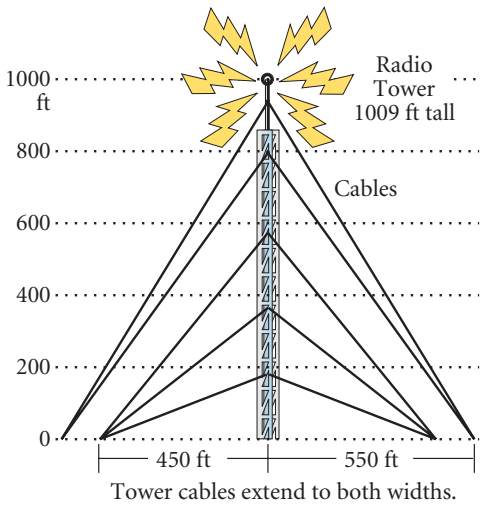
27. Write the Isosceles Triangle Theorem and its converse as a biconditional.

28. Critical Thinking An exterior angle of an isosceles triangle has measure 100. Find two possible sets of measures for the angles of the triangle.

29. a. Communications In the diagram at the right, what type of triangles are formed by the cables of the same height and the ground?

b. What are the two different base lengths of the triangles?

c. How is the tower related to each of the triangles?



30. Critical Thinking Curtis defines the base of an isosceles triangle as its "bottom side." Is his definition a good one? Explain.

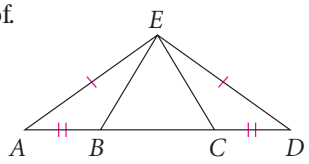
31. Reasoning What are the measures of the base angles of an isosceles right triangle? Explain.

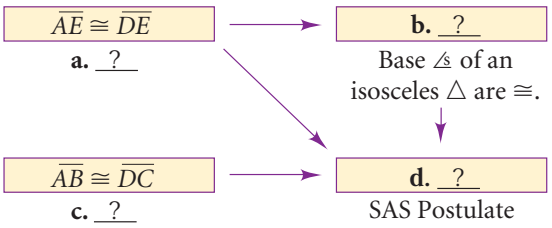
32. Writing Explain how each corollary on page 212 follows from its theorem. First, write one explanation and then write the second similar to the first.

33. Developing Proof Copy and complete the flow proof.

Given: $\overline{AE} \cong \overline{DE}, \overline{AB} \cong \overline{DC}$

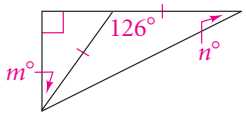
Prove: $\triangle ABE \cong \triangle DCE$





Algebra **Find the values of m and n.**

34.



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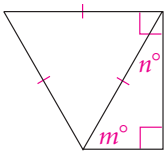
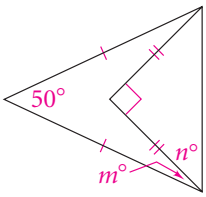


36.



Challenge

Coordinate Geometry **For each pair of points, there are six points that could be the third vertex of an isosceles right triangle. Find the coordinates of each point.**

37. (4, 0) and (0, 4) **38.** (0, 0) and (5, 5) **39.** (2, 3) and (5, 6)

40. Algebra A triangle has angle measures $x + 15$, $3x - 35$, and $4x$.

a. Find the value of x.

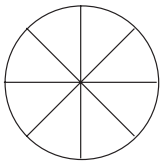
b. Find the measure of each angle.

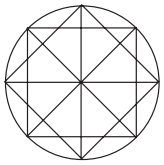
c. What type of triangle is it? Why?

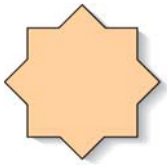
Proof **41.** Write a paragraph proof of Theorem 4-5 using the diagram next to it on page 211.

42. State the converse of Theorem 4-5. If the converse is true, write a paragraph proof. If the converse is false, give a counterexample.

43. Crafts The design in Step 3 is used in Hmong crafts and in Islamic and Mexican tiles. To create it, the artist starts by drawing a circle and four equally spaced diameters.


Step 1


Step 2


Step 3

a. How many different sizes of isosceles right triangles can you find in Step 2? Trace an example of each onto your paper.

b. How many times does a triangle of each size in part (a) appear in the Step 2 diagram?

Reasoning **What measures are possible for the base angles of each type of triangle? Explain.**

44. an isosceles obtuse triangle

45. an isosceles acute triangle

Standardized Test Prep

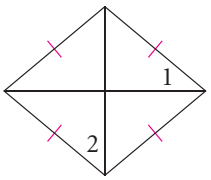
Multiple Choice

46. In isosceles $\triangle ABC$, the vertex angle is $\angle A$. What can be proved?

A. $AB = CB$ **B.** $\angle A \cong \angle B$

C. $m\angle B = m\angle C$ **D.** $\overline{BC} \cong \overline{AC}$

47. In the diagram at the right, $m\angle 1 = 40$. What is $m\angle 2$?



F. 40 **G.** 50 **H.** 80 **I.** 100

48. In an isosceles triangle, the measure of the vertex angle is $4x$. The measure of each base angle is $2x + 10$. What is the measure of the vertex angle?

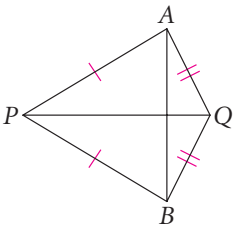
A. 10 **B.** 20 **C.** 50 **D.** 80

Short Response

49. In the figure at the right, $m\angle APB = 60$.

a. What is $m\angle PAB$? Explain.

b. $\angle PAB$ and $\angle QAB$ are complementary. What is $m\angle AQB$? Show your work.



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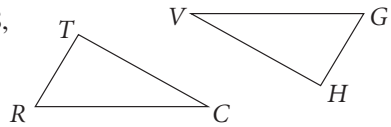
Online lesson quiz at **www.PHSchool.com**
Web Code: afa-0405

Mixed Review

Lesson 4-4

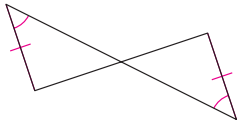
50. $m\angle R = 59$, $m\angle T = 93 = m\angle H$, $m\angle V = 28$, and $RT = GH$. What, if anything, can you conclude about RC and GV? Explain.



Lessons 4-2, 4-3

Which congruence statement, SSS, SAS, ASA, or AAS, would you use to conclude that the two triangles are congruent?

51.



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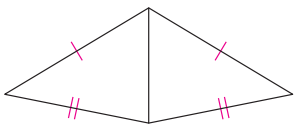
2.



Lesson 3-4

53. How many sides are in a regular polygon whose exterior angles measure 15°?